REMARKS

The present invention resides in a highly competitive field where numerous large international companies are seeking to improve light sources while conserving energy. In the desire to replace the incandescent light bulbs, advantages have been found in utilizing light emitting diodes (LED's). The present invention is capable of economically producing the desired color temperature in an array of LED's that are properly covered with a phosphor film to provide the appropriate blended white light. The semiconductor light emitting device of the present invention also permits appropriate testing and can improve yield during the manufacturing process while maintaining a compact size.

The present invention further ensures that light obstruction components that exist in prior art configurations in obscuring or shadowing the emission of light, are not an issue, while facilitating an easy electrical mounting in a lighting structure to receive power.

Given the large number of highly skilled engineers and scientists that are working on these issues, the present invention more than adequately provides technological advances over the cited art.

> "Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light."
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> *Continental Can Co. USA Inc. v. Monsanto Co.*, 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

The Office Action rejected Claims 35-36, 40-41 and 46-48 and 50 under 35 U.S.C. §103 as being unpatentable over *Durocher et al.* (U.S. Patent No. 6,614,103) when taken in view of *Okazaki et al.* (U.S. Patent Publication No. 2003/0062530). The Office Action asserted that it ascertained the difference between the prior art and the claims at issue under the requirements of *Graham v. John Deere Company*, 383 U.S. 1 (1966). In this regard, the Office Action contended that the *Durocher et al.* reference taught a base substrate 41 for a semiconductor light emitting device. Applicants respectfully traverse this contention.

The *Durocher et al.* reference clearly teaches to a person of ordinary skill in this field that an LED chip 59 is described in Column 7 under the title *Mounting the LED Chips* relative to the disclosure in Figures 7 and 8. As noted specifically in Column 7, bonding pads 61 extend from the LED chip and the principal teaching and disclosure in *Durocher et al.* is purportedly directed to a unique method of mounting the bonding pads in a relatively rigid plastic carrier 21 or 31 found in Figures 2 and 3. The Office Action assertion that a base substrate 41 is taught is erroneous, since element 41 is simply a flexible thin plastic sheet that was described as follows, in Column 5, Lines 17-23:

> The flexible base 41 is preferably a sheet that is substantially thinner than the carrier 31. For example, the base 41 is preferably a sheet having a thickness of 0.5 to 3 mils, most preferably 1 to 2 mils thick, and is at least 10 times thinner than the carrier 31. Preferably, the base comprises a flexible plastic sheet that can support a plurality of carriers 31 and that can be bent into a desired shape. For example, the base 41 may comprise a Kapton® polyimide sheet that is provided as a roll by E.I. DuPont De Nemours & Co.

As can be appreciated by a person of ordinary skill in this field, he/she would not use a flexible thin polyimide sheet as a base structure for depositing a multilayer epitaxial semiconductor structure to create a light emitting diode.

Additionally, a person of ordinary skill in this field would quickly perceive that the teaching in *Durocher et al.* is only directed to a post packaging of a pre-existing LED chip and not to the manufacturing of such an LED chip in an optimum manner. In this regard, the *Durocher et al.* reference teaches that it is desirable to obtain a conformal LED array that can be bent to fit into a variety of differently shaped lighting products. To accomplish this packaging, however, they found it was necessary to provide a rigid carrier 21 as shown in Figure 2 as a first preferred embodiment and a rigid carrier 31 as shown in Figure 3 as a second preferred embodiment. See Columns 3 and 4 of the *Durocher et al.* specification. The carriers are further configured to provide a concave shape upon which a reflective surface 57 can be provided and to accommodate feed through elements, see Column 3, Lines 63-65, to transmit power to the bonding pads of the LED chip.

As shown in Figures 4 and 5, the carrier is molded of a plastic or polymer material, and is connected by either a regular adhesive 55 or an anisotropic conductive adhesive 53 for attachment to the flexible base sheet 41.

The Office Action further contended that a first power supply terminal and a second power supply terminal were "formed on a main surface of the base substrate." As can be seen in Figure 4, the base substrate again is construed as the flexible sheet 41 and from Figure 5, the electrical pattern is not on the carrier 31 and must be able to withstand the conformal manipulation of the flexible sheet in order to adapt to various lighting structures. Our claimed base substrate is more analogous to the *Okazaki et al.* base substrate 1 shown in Figure 1.

The Office Action further contended that a conductive member 49 included a first through hole provided in the base substrate. However, hole 49 is in a flexible plastic sheet of about 1 mil in thickness. The Office Action contended that the second conductive member

included a second through hole which are actually the electrodes 37 that are molded into the rigid carrier 31.

We assume that the obviousness rejection is following the examination guidelines of the U.S. Patent Office in view of the *KSR* case.

It is respectfully submitted that disregarding the true constructural configuration set forth in our claims of a relationship of a base substrate with the semiconductor multilayer layer epitaxial structure formed on one surface of our base substrate and the electrode thin layers formed on another surface of the same base substrate must be found in the cited references to have a proper rejection that is not simply based on hindsight. Combining an element of a solid plastic carrier with an extremely thin flexible plastic sheet and equating these two elements to a semiconductor substrate of an LED chip could only have been done in hindsight from our present invention and without regard for what a person of ordinary skill would expect as a predictable result.

The *Okazaki et al.* was cited for its teaching of a multilayer epitaxial structure, including a first conductive layer of an n-type GaN layer 2 and a second conductive layer of a p-type GaN layer 4 formed on a base substrate. The Office Action cited Paragraph 0049, which clearly discloses that the respective GaN layers 2 and 4 "are sequentially grown on the sapphire substrate 1 by crystal growth." As noted in the MPEP §2141, when applying 35 U.S.C. §103, the claimed invention must be considered as a whole and equally important, the references must be considered as a whole, in determining the desirability and the obviousness of making a proper rejection in combining references.

> A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would be lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*,

> 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).
>
> MPEP 2141.02 VI

In applying this standard to the teaching of the *Okazaki et al.* reference, a person of ordinary skill in the art would be quite aware that the following teachings were cited in Paragraph 0004 as follows:

> Moreover, because of their crystal growth temperatures being high, nitride compound semiconductors are stable materials even under high temperatures, and their use to electronic devices is hopefully expected.

Accordingly, the respective GaN layers cited in the rejection could not be grown at the high temperatures necessary on a thin flexible polyimide sheet cited as the base in the *Durocher et al.* disclosure.

> [I]t is generally settled that the change in prior art device which makes the device inoperable for its intended purpose cannot be considered to be an obvious change.
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> *Hughes Aircraft Co. v. United States*, 215 U.S.P.Q. 787, (Ct.Cl. Trial Div. 1982)

Actually, the *Okazaki et al.* reference would teach a person of ordinary skill in this field the desirability of resolving a high contact resistance problem at the electrode portions and addressing the insufficient external quantum efficiency of light. See Paragraphs 0008-0010.

The solution taught was providing a high concentration of a p-type dopant such as Magnesium near the surface of the p-type GaN layer to improve the ohmic contact resistance and further, addressing the restrictive refractive index of a GaN with a small critical angle of refraction by embossing the light emitting surface embossment.

Accordingly, applicant respectfully traverses the contention that a person of ordinary skill in the art at the time our invention was made would provide the invention of *Durocher et al.* with

a light emitting device of *Okazaki et al.* simply because they both teach analogous art relating to light emitting devices.

Our recent discussion with Pinchus Laufer in the Office of Patent Legal Administration, who was involved in writing the Examination Guidelines for Determining Obviousness under 35 USC §103 in view of the Supreme Court decision in *KSR International Co. vs. Teleflex, Inc.* verified that the KSR decision still required a specific rationale that could not be based on hindsight for purportedly combining the elements in the prior art to meet an invention defined in the patent claims.

Mr. Laufer incorporated the following from the existing MPEP into the Guidelines.

As noted in the MPEP at §2143.02:

> A rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art. *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1395 (2007); *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 62-63, 163 USPQ 673, 675 (1969); *Great Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152, 87 USPQ 303, 306 (1950). (underline added)

It is respectfully submitted that specific claimed juxtaposition of our elements on the semiconductor base substrate cannot be achieved by any purported combination of a thin flexible polyimide sheet being substituted for our base substrate since it is not capable of supporting a semiconductor light emitting device of the type shown in the *Okazaki et al.* disclosure.

In fact, a person of ordinary skill in the art of semiconductor light emitting devices and utilizing common sense, would quickly recognize that the *Durocher et al.* reference has no teaching with regards to a light emitting device other than assembling it as one component in the

plastic packaging of LED arrays, the actual invention being "the plastic packaging" to permit a flexible circuit module which uses a rigid carrier mounted by adhesion to a flexible base with LED chips simply mounted within these carriers.

The same person of ordinary skill reviewing the *Okazaki et al.* reference and utilizing, again common sense, would conclude doping p-type GaN layer to ensure sufficient ohmic contact was taught with an embossment of the surface such as a series of fluted grooves, would improve the light refraction characteristics.

Thus, while the *Okazaki et al.* reference could be the form of a chip to be mounted within the rigid carrier, it would include a semiconductor base 1 which could not be equated to either the rigid plastic carrier or the flexible polyimide base sheet of the *Durocher et al.* disclosure.

As noted in ex parte *Rinkevich et al.*, Appeal 207-1317, May 29, 2007 at Page 9:

> We note that the U.S. Supreme Court recently reaffirmed that "[a] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautions of argument reliant upon *ex post* reasoning." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 82 USPQ2d at 1397. *See also Graham v. John Deere Co.*, 383 U.S. at 36, 148 USPQ at 474. Nevertheless, in *KSR* the Supreme Court also qualified the issue of hindsight by stating that "[r]igid preventative rules that deny factfinders recourse to common sense, however, are neither necessary under our case law nor consistent with it." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 82 USPQ2d at 1397. In the instant case, we conclude that a person of ordinary skill in the art *having common sense* at the time of the invention would not have reasonably looked to Wu to solve a problem already solved by Savill. Therefore, we agree with Appellants that the Examiner has impermissibly used the instant claims as a guide or roadmap in formulating the rejection.

Claims 37 and 49 were rejected over *Durocher et al.* in view of the *Okazaki et al.* disclosure, when further taken in view of *Baik et al.* (U.S. Patent Publication 2004/0108511).

The *Baik et al.* reference was cited purportedly to teach a sapphire substrate 22 and more particularly to teach a formation of a back reflective structure within the manufacturing of an LED.

Accordingly, a reflective layer 15 made of a metal alumina layer can be utilized as a reflective layer, including an aluminum layer. As noted in Paragraph 0026, the formation of an alumina layer requires a heating temperature to be applied in the bonding step within a range of 250°C to 500°C. While this is possible on a sapphire substrate, it is not possible on the *Durocher et al.* flexible polyimide sheet relied upon as teaching our substrate.

Thus, even in hindsight, a person of ordinary skill in the art would not resort to this reference to resolve any of the deficiencies in the cited *Durocher et al.* and *Okazaki et al.* references.

Finally, Claim 51 was rejected over *Durocher et al., Okazaki et al.,* and *Lee* (U.S. Patent Publication 2003/0190764).

The *Lee* reference was simply cited to teach a Ni/Au/ITO type electrode. Other than this feature and the high temperatures of 400°C to 600°C for annealing the structure, there is no suggestion of the unique combination of the elements in our claims that justifies a rejection under 35 U.S.C. §103, even if hindsight is utilized from our application.

According to the currently amended Claim 35, the invention of the present application is a structure in which a thin-film lead pattern is provided on both main surfaces of the base substrate with use of a through-hole provided in the base substrate, and both of the main surfaces function as a single semiconductor light emitting device. An effect of the present invention is that external electrodes (the power supply terminal thin-film layers) are provided on the bottom main surface that is opposite from the main surface supporting the epitaxial structure covered by

the phosphor film, thereby preventing shadows from appearing in the illuminated light since light blocking components such as bonding wire do not exist on the light extracting surface. (See WO 05/022654, Page 39, Line 6; Page 50, Line 11; and Page 87, Line 23 of the description.)

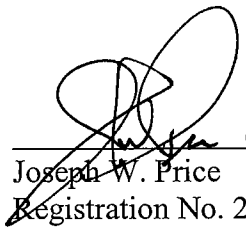
Neither *Durocher et al.* nor *Okazaki et al.* contain any hint at or disclosure of such a structure of the present invention in which only electrode thin-film layers on both surfaces of the base substrate are paths for electrical connection. Also, the present application is believed to be the first to propose this kind of semiconductor light emitting device having a thin-film pattern on both surfaces of the base substrate. Therefore, in view of the fact that *Durocher et al.* recites the use of wiring leads and the fact that *Okazaki et al.* recites the use of conductive wiring on only one surface of the base substrate, the present invention clearly has non-obviousness over both of the cited documents.

In accordance with the above comments, it is believed that the case is now in condition for allowance and an early notification of the same is requested.

If the Examiner believes a telephone interview will help further the prosecution of this case, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

SNELL & WILMER L.L.P.



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